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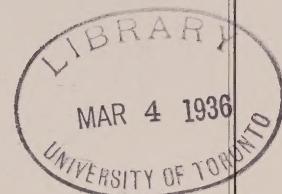
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THE PEAR PSYLLA

AND ITS CONTROL

By WILLIAM A. ROSS

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The Pear Psylla and its Control

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During the past decade the pear psylla, *Psyllia pyricola* Forster, has been very destructive to pear trees in the Province of Ontario, notably in the fruit growing sections bordering Lake Ontario, from Burlington to Niagara river, and the probabilities are that the insect will become increasingly important with the

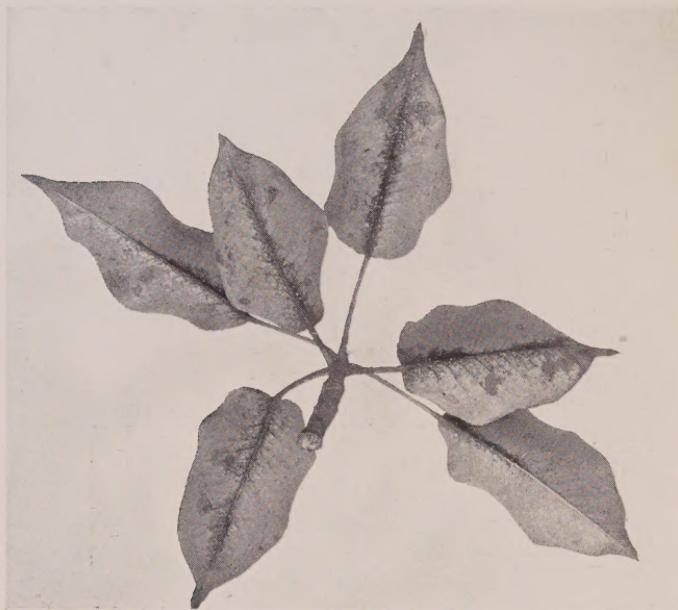


Fig. 1—Leaves showing sooty honey-dew fungus and psylla nymphs.
(Author's illustration)

planting out of more pear trees. The consensus of opinion among pear growers who have suffered from its depredations is that it is by far the most injurious insect with which they have to contend.

NATURE OF INJURY

The psylla causes injury by extracting, with its sucking mouthparts, the sap from leaves, leaf stems, fruit stems and tender wood on which it feeds. On badly infested trees, the continual sapping of the life juices by myriads of psyllas

robs the trees of vitality, dwarfs the fruit, produces brown, dead areas on the leaves and causes the foliage to drop prematurely. Trees seriously weakened by the psylla will not bear profitable crops, and are especially susceptible to winter killing, in a hard winter readily succumbing to low temperatures.

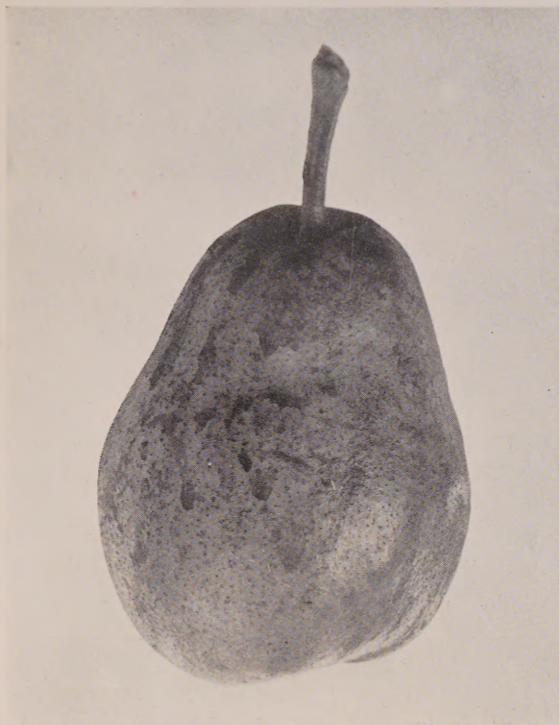


Fig. 2.—Pear smutted with honey-dew fungus. (Original)

Large quantities of sweet, sticky liquid, called honey-dew, are excreted by the psylla nymphs, and on infested trees the fruit, foliage, twigs and branches may be covered with this material, and with a sooty fungus which grows in it (figs. 1 and 2). This coating of honey-dew and sooty fungus not only makes the trees and fruit very unsightly, but also interferes with the proper functioning of the leaves.

DESCRIPTIONS

Adult.—The adult psylla or "fly" (fig. 3) is a tiny four-winged insect, about one-tenth of an inch in length. The transparent wings slope roofwise over the abdomen, and the legs are adapted for jumping. The summer form is reddish with dark markings, whereas the winter or hibernating form is dark-brown or black.

Egg.—The egg (fig. 4) is a minute, sub-oval, yellowish body just visible to the naked eye. It is attached to the leaf or bark by means of a short stalk near the basal end.



Fig. 3.—Adult pear psylla. (Original)

Nymph.—The nymph or immature psylla (fig. 4) is oval in shape and very flat. In growing, it passes through five stages. In the first three stages it is yellowish; in the last two it is brownish or dark-brown, and has conspicuous wing pads.

LIFE-HISTORY

The winter is passed in the adult stage. The adults hibernate chiefly under the rough bark of pear trees, and of any other trees which happen to be in or near

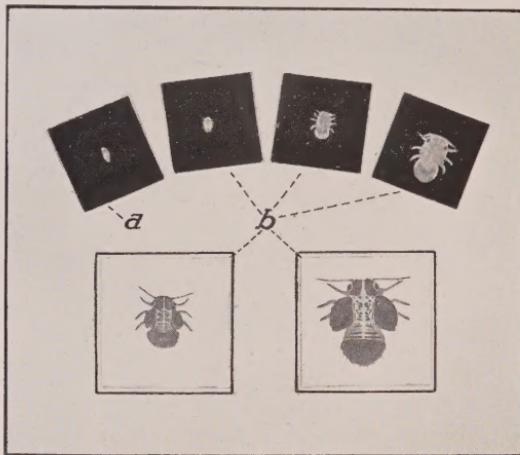


Fig. 4.—Pear psylla—*a*, egg; *b*, various stages of the nymphs.
(Author's illustration)

the orchard. In late March or early April the insects leave their winter quarters, congregate on the twigs and fruit spurs, and, in a short time, provided the weather remains favourable, commence to lay eggs. Each female is capable of laying from 200 to 400 eggs. Oviposition may continue until about the time the petals drop; but the vast majority of the eggs are laid by the time the fruit buds have burst. The eggs are deposited on the twigs, fruit spurs and smaller branches, chiefly on the under surface. They commence to hatch when the fruit buds are beginning to break, and nearly all have hatched by the time the petals drop.

The period of incubation varies, according to temperature, from nine to thirty-two days, the average being about three weeks. The newly hatched nymphs migrate to the opening buds, where they feed chiefly on the leaf petioles and blossom stems. They grow rapidly and moult five times, reaching the adult stage in about one month. This first brood is then succeeded by three other broods and the life-cycle is finally completed in the fall by the appearance of winter adults—the hibernating form.

The summer adults are more prolific than the hibernating form. Their reproductive capacity according to our observations may vary from an average of about 500 to a maximum of nearly 700 eggs per female. They lay their eggs on both sides of the foliage, principally along the midrib (fig. 5). These hatch during warm weather in about eight to ten days, the nymphs reaching maturity in from two to four weeks.



Fig. 5.—Showing psylla eggs along mid-rib of leaf. (Author's illustration)

CONTROL

Reference should first be made to what may be termed the horticultural aspects of pear psylla control. It is well known that the psylla is primarily a pest of large orchards, and that it is, comparatively, of little importance in small plantings, unless the latter are sheltered by tall hedges or large trees. It has been observed that the insect multiplies most rapidly where the pear trees are thickly planted; where the wood growth on the trees is dense, and where the orchards are protected by wind breaks. From this it is apparent that the psylla thrives best under sheltered, still conditions, and conversely that good air drainage in and around the trees is more or less unfavourable to the insect. It follows, therefore, that those factors which have a bearing on orchard air drainage, namely, (1) the orchard site, (2) distance of planting, (3) pruning practices, (4) windbreaks, have likewise an important bearing on psylla control.

The Orchard Site.—Wherever possible the pear orchard should be planted on sloping land with no deep hollows in it, avoiding the immediate neighbourhood of tall hedges or of large low-headed trees.

Distance of Planting.—Very often a grower has little or no choice in deciding on a site for the orchard, but he always has control over the distance of planting. The trees should be planted the maximum distance apart, which in the case of standard trees is not less than 25 feet by 18 feet, or 20 by 20 feet. The conditions afforded by closely planted trees are undoubtedly very conducive to the rapid multiplication of the psylla and it has been frequently noted that it is in very closely planted orchards that the insect "comes back" most quickly.

*Pruning Practices.**—Moderate annual pruning, which produces trees with properly spaced branches, open and not too high, not only makes conditions less favourable for the insect, but also simplifies spraying by making it easier to coat thoroughly all parts of the trees with spray mixtures.

Windbreaks.—Windbreaks undoubtedly make conditions particularly favourable to the pear psylla, and, for this reason, should not be planted in the immediate vicinity of pear orchards.

SPRAYING

Orchard experiments, conducted by the Dominion Entomological Branch, have demonstrated that, of several methods of combating the pear psylla, the cheapest and most effective is to apply a 3 per cent lubricating oil emulsion spray in late March or early April, after all the adults have emerged from their winter quarters, and preferably before egg-laying has commenced. A period of warm weather in late March or early April induces the insects to leave their winter quarters and to congregate on the twigs and fruit spurs. The adult psyllas or "flies" are sluggish at this time of year and, therefore, can be readily destroyed by coating them with the spray material. In making this application it is essential:—

- (1) That the spraying of a tree should be completed—sprayed from all sides—before passing on to the next tree.
- (2) That liberal quantities of the spray material should be used, and that pains should be taken to wet thoroughly all parts of the tree.
- (3) That other fruit trees, interplanted with or immediately adjoining the pears, should be sprayed at the same time.
- (4) That preferably the spraying should be done during cool weather.

* Mr. J. A. Neilson, of the Horticultural Experiment Station, Vineland Station, Ontario, has kindly prepared the following outline of the method of training pear trees on the open centre or vase plan:—

"In starting an open centre tree, one year whips are headed back to a height of 24 to 30 inches at planting time. As a result of this heading back several shoots will likely grow on the upper part of the trunk. The following spring from three to five of the best of these should be selected to form the main framework and all others removed. When choosing the foundation branches, select those that are evenly placed around the circumference of the tree and well spaced along the vertical axis. Where these leader branches have made vigorous growth, they may be headed back moderately, but usually little heading back is necessary or advisable except to balance the tree. In the second season numerous laterals will likely develop on the leader branches. Two of the best of the side laterals should be selected as secondary branches and the rest removed. After a good foundation has been formed, it will only be necessary to cut out the least valuable of crowding branches and those that tend to fill up the centre. Where it is necessary to remove leader branches, it is advisable to cut just above an outward growing lateral in order to keep the centre open. When leader branches are headed back to buds instead of strong lateral branches, the tendency is for several buds, just back of the cut, to develop into branches, giving a bushy effect. This is undesirable and is easily avoided by proper pruning. When thinning out, remove branches completely. When heading back, head back to side branches. Those methods will maintain an open tree and will permit of free entry of air, sunlight and spray materials."

During the past two seasons (1924 and 1925) one application of oil has given excellent commercial control under Ontario conditions, but in years of very severe outbreaks, and in orchards where conditions are especially favourable for the insect, it may be necessary to apply an extra spray in July at the time when most of the insects are, so-called, soft-shelled nymphs (1st, 2nd, and 3rd instars). For this extra application nicotine sulphate $\frac{1}{2}$ pint, hydrated lime 10 pounds, and water 40 gallons may be used. It should be emphasized that here again thoroughness in spraying is more than half the battle.

LUBRICATING OIL EMULSIONS.

Among the various lubricating oil emulsions which have been tested by the Dominion Entomological Branch, the two which apparently are most satisfactory, from the orchardist's point of view, are as follows:—

(1) *Bordeaux-Oil Emulsion:*

Red paraffin oil*	3 gallons
Water	1½ "
Copper sulphate (bluestone)	6 ounces
Hydrated lime	6 "

When diluted in water to 100 gallons, the above amount of stock emulsion makes a 3 per cent oil spray.

(2) *Calcium Caseinate Emulsion:*

Red paraffin oil*	3 gallons
Water	1½ "
Calcium caseinate	6 ounces

When diluted in water to 100 gallons, the above amount of stock emulsion makes a 3 per cent oil spray.

Method of Emulsifying.—The simplest method of making a Bordeaux oil emulsion under orchard conditions is as follows:—

Place a container with the oil in it alongside the spray outfit. Dissolve the bluestone in one-half the amount of water, and the lime in the other half. Pour the bluestone solution and then the lime-water into the oil and stir. Take the suction hose out of the tank and put it into the oil mixture, start the engine, and under high pressure pump the mixture back into itself through the gun until all the oil is properly emulsified. While this is being done, the tank should be filled with water. When the tank is full and all the oil emulsified, the emulsion should be pumped into the tank through the gun.

In the case of a spray machine with no suction hose, sufficient material for one day's spraying should be emulsified in the tank, and the correct amount of emulsion for a tank of spray should be run off into each of several containers.

The calcium caseinate emulsion is prepared by converting the calcium caseinate into a thin paste with a small quantity of water, diluting this with the balance of the water, then pouring it into the oil and emulsifying as mentioned above.

In connection with the manufacture and use of home-made lubricating oil emulsions, the following points are important:—

(1) In making oil sprays, pumping under high pressure should be continued until the whole mixture has been converted into a thick, uniform emulsion *with no free oil in it*. A properly made emulsion will mix readily with water, giving a smooth, uniform spray material with *no oil floating on the surface*.

* Any lubricating oil, with characteristics approximately the same as the following, should prove to be satisfactory for psylla control.

Gravity at 60° F.	24 to 26 A.P.I.
Flash Point (open cup)	360° F. (minimum)
Viscosity at 100° F.	170 to 220 seconds (Saybolt)
Volatility (loss at 105°-110° C. after 4 hours)	0.41 per cent.
Pour and Solid	40°/35° F.

(2) In view of the fact that Bordeaux and calcium caseinate emulsions are not particularly stable, it is considered advisable to prepare them as needed at the time of spraying.

(3) If a stock emulsion is made some time prior to spraying and oil separates out of it, the mixture should be re-emulsified by pumping. If, however, the emulsion does not break down until diluted, the spray mixture should be emptied out on the ground—the oil scum must not be allowed to go on the trees.

(4) A 3 per cent oil spray should only be used for dormant or delayed dormant applications. It should never be applied to foliage.

(5) Oil sprays should not be applied until all danger of zero weather is past.